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A STUDY OF THE EFFICIENCY OF LEARNING WHEN BOTH INCIDENTAL AND INTENTIONAL LEARNING OCCUR SIMULTANEOUSLY. FINAL REPORT.

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THE EFFECT OF INCIDENTAL VISUAL STIMULI ON THE EFFICIENCY OF LEARNING FACTUAL MATERIAL BY FRESHMAN COLLEGE STUDENTS WAS INVESTIGATED. THE INVESTIGATORS DETERMINED WHETHER THE PROVISION OF INCIDENTAL STIMULI, WHEN USED TO FACILITATE LEARNING, RESULTED IN IMPROVED TEST PERFORMANCE. BRIEF, HIGH INTENSITY STIMULI, SEX DIFFERENCE, COLOR OF FOCAL MATERIAL AND CUE WORDS, AND CONTROL OF THE PRESENTATION OF FOCAL MATERIAL AND INCIDENTAL STIMULI BY A GROUP TEACHING DEVICE WERE THE CRITERION VARIABLES. THE LEARNING SITUATIONS INVOLVED THE VISUAL PRESENTATION (USING TWO PROJECTORS) OF 32 SLIDES SHOWING 32 UNRELATED "BITS" OF FACTUAL INFORMATION, AND 32 PAIRED CUE SLIDES TO HIGHLY MOTIVATE THE SUBJECTS. THE RESULTS EMPHASIZE THE IMPORTANCE OF MOTIVATION IN CONNECTION WITH INCIDENTAL LEARNING. THE FINDING THAT MOTIVATED COLLEGE STUDENTS CAN IMPROVE TEST PERFORMANCE THROUGH THE USE OF INCIDENTAL STIMULI IMPLIES THAT IT IS POSSIBLE TO IMPROVE THE EFFICIENCY OF THE LEARNING OF FACTUAL MATERIAL IN THE CLASSROOM BY CAUSING BOTH INCIDENTAL AND INTENTIONAL LEARNING TO OCCUR SIMULTANEOUSLY. THE TEACHING METHOD EMPLOYED IN THIS STUDY MAY BE SUITABLE FOR REMEDIAL TEACHING IN THE AREAS DEALING PRIMARILY WITH FACTUAL MATERIAL. (AUTHOR/IM)

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I. INTRODUCTION

(a) Objectives: This project examined the possibilities of improving the efficiency of learning in typical classroom situations by causing both incidental and intentional learning to occur simultaneously. The answers to the following five principal questions were sought in respect to the effect of incidental visual stimuli on the several learning situations employed. Does the provision of incidental stimuli, when used to facilitate learning, result in:

1. Improved test performance?
2. Greater improvement in test performance than identical brief, high intensity stimuli?
3. Improvement in test performance associated with sex difference?
4. Improvement in test performance associated with color of focal material and cue words?
5. Greater improvement in test performance when the subjects control the presentation of focal material and incidental stimuli by means of a group teaching device?

An analysis of variance was used to test null hypotheses with respect to treatment method, sex difference, and the interaction of these effects where the criterion variable was difference in test and retest score on the test instrument.

(b) Problem: This project investigated the effect of incidental visual stimuli on the efficiency of learning factual information by freshmen college students.

The learning situations employed the visual presentation, using two projectors, of 32 slides showing 32 unrelated "bits" of factual information, and 32 paired cue slides. The incidental stimulus or cue for each focal slide was a word closely associated with the factual material included in the related focal slide.

The stimuli were incidental or marginal because of their brief duration and because they were not focal or attended to. The subjects were aware that they were to receive help in the learning situations but not the manner in which the help was to be provided.

Because of the nature of the focal material, it was assumed that the showing of the focal slides provided an opportunity for intentional learning.

The verbal learning situations were employed to investigate whether tachistoscopically presented incidental word stimuli,

intended to facilitate learning, would result in test performance which was:

1. Improved.
2. Related to stimulus magnitude.
3. Related to sex.
4. Related to color.
5. Related to the method of control of the presentation of focal material and cue word.

While past research indicated that the use of incidental cues can promote learning, the variables which relate to the resultant learning still have to be explicated. Readily attackable variables of sex, certain focal and incidental stimulus characteristics, and methods of presentation were dealt with in this study.

(c) Related Research: McGeoch and Irion (6), in summarizing the early research pertaining to incidental learning, stated that incidental learning occurs, but that it is much less efficient than intentional learning. Cohen (1) found that junior high school students with a low level of motivation did not improve their learning significantly when helpful incidental stimuli were provided. A further study by Cohen (3) indicated that motivated junior high school students did use incidental stimuli to a significant degree to improve their learning efficiency. Newmark and Saltzman (7) indicated that the amount of incidental learning is related to the duration of the incidental stimuli. Research by Saltzman and Atkinson (12) demonstrated that the number of incidental-stimuli presentations could affect the extent to which incidental learning occurs. Studies by Postman and Adams (9) and Saltzman (11) indicated that the amount of incidental learning is dependent on the type of orientating task. In this same area, Quartermain and Mangan (10) found incidental learning to be dependent on the degree of relevance of the incidental to the intentionally learned material.

Sharp (13) examined the effect of tachistoscopically presented subliminal cues on test results. He found that for 60 per cent of his subjects the cues were probably supraliminal. Since Sharp demonstrated that his subjects were influenced by the cues he presented, supraliminal cues may have contributed importantly to the behavioral changes noted.

Oxhandler (8) investigated the possibilities of using tachistoscopically presented subliminal stimuli for teaching. He later indicated that his cues were probably supraliminal for some of his subjects. The results of both Sharp and Oxhandler indicate the possibility of behavioral changes occurring, under the conditions of their experiments, as a result of supraliminal cues

tachistoscopically presented.

Cohen and Nelson (4) found implications that the learning of a simple conceptual task, by college students, is facilitated by either non-colored or colored incidental-word stimuli. However, only females were found to demonstrate significantly improved learning with colored materials. Cohen (2) found that for a simple conceptual task there is a significant correlation between selected personality traits of college students and incidental learning, and also that males and females use incidental stimuli differently. Cohen and Nelson (5) investigated the effect on choice of geometric forms using differently colored, similar, geometric forms as incidental cues, and found that male and female junior high school students did not use the colored incidental cues in the same way.

The research which has been cited suggests the possibility of improving the efficiency of learning by causing students to employ, simultaneously, the conscious and the subconscious portions of their minds in the same learning situation. The concept being that the resulting learning would be the summation of the intentional and the incidental learning, and therefore more efficient since the whole would be greater than any of its parts. The design of the experiment incorporated the findings of others in respect to the conditions under which incidental learning does occur.

II. METHOD

(a) Design: The general design used involved a control group consisting of 32 subjects and four experimental groups, each consisting of 32 subjects. All groups were selected by stratified random sampling such that each group had approximately the same verbal ability. The control or no-cue group received no intentionally helpful stimuli while two of the cue groups received helpful cue words of different magnitude, one incidental, and the other brief at high intensity. The third cue group received the incidental cues and focal material in color, red for the focal material, and yellow for the cue word. The fourth cue group received incidental cues, but the subjects used a teaching device to control the presentation of the focal material and incidental cues. Each group had an equal number of male and female subjects in order to permit examining differences related to sex. This design appeared to be particularly appropriate for achieving the verbally related objectives in that the control and experimental groups were homogeneous in respect to verbal ability.

The independent variables were sex, cue magnitude, cue and

focal material color, and method of control of the presentation of focal material and cue word. The research of others, as well as our own research, has indicated further need to determine the effect of these variables which are some of the primary factors that could be operating in a classroom situation where incidental stimuli might be used to affect the learning situation.

The dependent variable was the difference in the score (the number of correct responses) on the test and on the retest for each subject, since this measure is the obvious relevant indicator of change in performance (and hence, presumably, of the learning which occurred).

(b) From a total population of about 500 college freshmen at Saint Leo College, one hundred and sixty subjects, 80 male and 80 female were randomly selected. The subject pool was divided by sex, and the males and females separately distributed into four sub-pools of poor, fair, good, and excellent verbal ability as measured by their CEEB verbal scores. Five groups of 16 male and 16 female subjects each were selected randomly from the sub-pools such that each group had the same approximate mean verbal ability and also such that the males in each group and the females in each group had the same approximate verbal ability. This method of selection insured a stratified random sample in which the no-cue and the several cue groups were equated in respect to verbal ability and composition by sex.

(c) The first step in the overall procedure was to determine the individual requirements of the magnitude, described in terms of intensity and duration, to project an incidental word stimulus at a definably supraliminal level for the subjects in Groups II, III, and V. Next, the five groups of 32 subjects each, designated as Groups I, II, III, IV, and V were shown 32 slides consisting of 32 unrelated units of factual information and then administered a 32-question multiple-choice test based upon the factual information shown. In the treatment portion of the procedure, each of the five groups was given a different treatment in respect to the mode of incidental cue presentation during the showing of the same 32 slides. The criterion performance for the retest was measured using the same test instrument previously employed in the test phase.

(d) The apparatus for the project consisted of two Kodak Carousel Projectors, Model 550, fitted with ASA code DFW lamps (500 watt, 115-120 volt, T-12 bulb, C-13 D filament), and five-inch focal length, f/3.5 Kodak Ektanar lenses; a Superior Electric Company Powerstat, Type 115, graduated in one-volt units with an output of from 0 to 140 volts; a modified U.S. Navy, Bureau of Aeronautics Flash Quizzer, Device 5DD, Contract No. NO a (S) 1965, NAVER No. 30-50-R-71; and a beaded Radiant

projection screen.

The normal voltage supply to the projection lamp of one of the Carousel projectors was disconnected and a direct supply line to the lamp provided such that the power to the lamp was controlled with the powerstat. The voltage to the lamp could be varied from 0 to 120 volts, thus controlling the intensity of the projected incidental stimuli. This modified projector was used exclusively for the projection of the cue words.

The modifications to the Flash Quizzer were more extensive. The only original components used were the constant speed motor, its assembly of contact switches, the double solenoid-operated shutter and the electronic shutter timing components. The shutter housing was modified to fit over the projection lens of the projector used to show the incidental stimuli. The resulting assembly permitted the cues to be projected with lamp voltages of from 1 to 120 volts and with time durations of 1/100, 1/50, 1/25, 1/10, 1/5, or one second. The device was programmed to produce 7 flashes in 7 seconds, 8 seconds off, and then to repeat the same fifteen-second cycle.

The group teaching device used by Group V is a system designed by Cohen, for a different purpose, and consists of 16 individual student control units, and a master control unit which together provided a group of 16 subjects with remote control operation of the two 35 mm projectors as they projected the focal material and the incidental cue words for the treatment of Group V (8 male and 8 female each in two showings). The slowest reader in the group controlled the rate at which the slides were shown, since the locking of the 16 relays in the student control units was required for the activation of the master control unit.

(e) The materials used with the above-described equipment consisted of 64 glass-mounted 35 mm slides. The unrelated factual information, which was the focal material, was presented on 32 slides. Each one of these slides had its corresponding word cue on a separate slide which was used to provide, beneath the focal material, the intermittently superimposed word cues which were the incidental stimuli. In addition to the slides, two Kodak Wratten gelatin filters were employed to produce the desired colors: a No. 12, yellow, and a No. 25a, red.

The test instrument consisted of 32 multiple-choice questions made up of a portion of the statement from each of the 32 slides which presented the factual information.

Because of the described relation between the structure of the slide and the corresponding test question, and because of the

requirement that the test items must be unrelated to each other, it was necessary to construct the test instrument rather than use a standardized test. A sample slide text, its associated cue word, and test question are included as Appendix (I), in addition a duplicate of the test instrument is included as Appendix (II).

To obtain the initial level of performance, treatment groups were shown the visual material and were tested on it. Subjects were told the following: that the purpose of the study was to try out a new method of teaching which, if successful, would help them learn faster and with less effort; that they would be shown 32 slides, each of which would present factual information in a unique way; and that following the showing, they would be given a short test on the material.

All operations associated with the project, other than the first showing of the material and the related test, were conducted in the same room. All subjects were seated so as to insure that they could see the screen without difficulty. The room was darkened and the 32 focal slides were shown at the "LOW" (300 watt) setting, allowing thirty seconds per slide. Following the showing of the slides, test instructions were given and thirty minutes allowed for completion of the written multiple-choice test.

The treatment and retest were given separately to each of the five groups some three weeks following the original test. (Group V was treated 16 subjects at a time, 8 male and 8 female). For each treatment group, the projector was fifteen feet from the projection screen; mean seating distance was twenty feet from the screen, and the "LOW" (300 watt) setting was used to project the focal slides. All subjects were told that this time the slides would be shown by a method that would help them learn faster and more easily. Group I was given the same treatment it had been given prior to the first administration of the test instrument; that is, without cues. For Group II, the 32 focal slides were projected on the screen just as they had been the first time. In addition, for each slide, an incidental stimulus in the form of a word was flashed on the screen, below the printed words on the projected focal slide, 14 times at .02 second duration, at a 79.5 volt intensity, during the 30 seconds each slide was on the screen. This magnitude of the incidental cue words was that determined to be required by college-age subjects to react to an incidental word stimulus.

The procedure for Group III was the same as for Group II except that the incidental cue words were in yellow and the focal materials in red. (This color combination was selected because of results of previous research). The members of Group III were first given a test for color-blindness to insure that the results

would be valid. The treatment for Group IV was the same as for Group II except for the magnitude of the cue word, which was 1-second at 120 volts. The treatment for Group V was the same as for Group II except that the subjects used a group teaching device to control the presentation of the focal material and incidental cue words. The subjects in this group were instructed in the use of the group teaching device prior to the treatment. The retest for each group was administered separately after the completion of the group treatment. Each group was allowed 30 minutes to complete the written test.

(f) To test the null hypotheses with respect to treatment method, sex difference, and the interaction of these effects a 5 x 2 analysis of variance was used with the difference in test and retest score as the criterion variable. This analysis was followed by t tests when it was found that significant differences existed.

III. RESULTS

Under the conditions of the study, the provision of incidental stimuli, when used to facilitate learning, resulted in improved test performance. Such stimuli did not result in greater improvement in test performance than identical brief, high intensity stimuli. Neither was there greater improvement in test performance associated with the use of color, or when the subjects controlled the presentation of focal material and incidental stimuli by means of a group teaching device. There was no improvement in test performance associated with sex difference.

The mean number of correct responses for each group for the first test (no cues) were as follows: Group I, (Control Group) 12.19; Group II, 12.78; Group III, 12.87; Group IV, 12:00 and Group V, 11.18. The mean for all groups was 12.20.

For the retest which followed the treatment, the means for each group were as follows: Group I, (Control Group) 12.53; Group II, 18.10; Group III, 16.00; Group IV, 19.06; and Group V, 16.59.

The analysis of variance showed that there was a significant improvement in test performance due to the treatment methods employed ($F = 10.1$; F for $P_{.01}$ must be 3.44). Therefore the null hypothesis relating to treatment method must be rejected. There was no significant improvement due to sex difference ($F = .05$; F for $P_{.05}$ must be 3.91); and no significant interaction between treatment method and sex difference ($F = .04$; F for $P_{.05}$ must be 2.43). Therefore the null hypotheses concerning sex difference and interaction were confirmed.

Following the significant F test for treatment, t tests were made with the following results:

For no stimuli (Group I) and incidental stimuli (Group II), $t = -5.79$, $p < .01$.

For no stimuli (Group I) and colored stimuli (Group III), $t = -3.24$, $p < .01$.

For no stimuli (Group I) and high magnitude, stimuli (Group IV), $t = -5.8$, $p < .01$.

For no stimuli (Group I) and subject controlled presentation of learning material and stimuli (Group V), $t = -4.45$, $p < .01$.

Comparing different treatment methods for the four experimental groups, there was a significant difference only between the use of colored stimuli and the high magnitude stimuli, with the latter producing the greater improvement in learning: ($t = -2.81$, $p < .05$).

IV. DISCUSSION

The statistical analysis of the data indicates that, under the conditions of the experiment, a greater efficiency of learning can be expected when both incidental and intentional learning occur simultaneously.

The results of this project, and a previous study by Cohen (1), in which junior high school students were the subjects, provide an interesting comparison. The latter study did not result in a significant improvement in learning associated with the provision of incidental stimuli. Other than the age of the subjects, there was one primary difference, the degree of motivation. In the case of the college age students, they were working for a grade and were highly motivated, whereas, the junior high school students had been told they would not be graded on their performance and had a very low level of motivation. This comparison and a further study by Cohen (3) indicate that motivation is an important factor in respect to the degree incidental stimuli are used to improve learning.

The findings in respect to the use of colored stimuli was at variance with previous findings by Cohen (2) where it was determined that the red and yellow color combination was employed to advantage in a conceptual learning situation by those subjects who had attitudes and interests that were oriented towards femininity as opposed to masculinity. Possible explanations of the failure of the Group III females to obtain higher scores could be that the present study involved more difficult learning,

and also that the majority of the subjects may have had a tendency towards masculinity patterns. Any future replication should include the administration of a personality inventory for the subjects designated to receive colored stimuli.

The performance of Group IV using high intensity stimuli was not in conformance with previous findings by Cohen (3) and Cohen and Nelson (4) when both college age and junior high school age students rejected the use of high intensity cues. The difference in results must be attributed to the high level of motivation of the subjects in the current study.

The results obtained for Group V were unexpected. When the experiment was designed, it was expected that, since this group was controlling the rate of projection of slides, they would take longer to view the projected materials than the other groups. Accordingly, based on the findings of Saltzman and Atkinson (12), since these subjects would receive the stimuli a greater number of times, they should show greater improvement in learning. It was also considered that the greater involvement of this group in the conduct of the experiment would lead to higher scores. To explain the results obtained one must take into consideration the aura of competition that permeated the test setting. As each subject completed reading the material projected on the screen, he would press the button down on his control unit thereby emitting a clicking sound. As this sound was heard by the other subjects, they tended to respond by pushing their buttons, disregarding the fact that they had not assimulated the material adequately. What seemed to be prevalent was more a spirit of competition rather than of learning. It appeared that fear or anxiety existed among the subjects in that no one wanted to be the last person to press the button on his control unit. There is some question concerning the validity of the results for this group because of the lack of adequate control. The subjects persisted in their original attitude to a lesser degree as a result of detailed instructions to read slowly and carefully followed by a second trial. This difficulty could be overcome by the use of silent push buttons on the control units.

V. CONCLUSIONS

The objective of this project was to determine whether the efficiency of learning could be improved by causing both incidental and intentional learning to occur simultaneously. The study showed that incidental stimuli do promote learning. Significantly improved test performance was recorded in all groups that employed incidental stimuli. There was, however, no significant difference in the amount of improvement associated with sex difference. In addition, the use of colored incidental stimuli and focal material; the use of clearly visible stimuli; and the

use of subject controlled presentation of incidental stimuli and focal material, did not result in significantly greater test improvement than did non-colored incidental stimuli.

The results imply that incidental stimuli can be used in the classroom to facilitate the learning of factual material by causing both intentional and incidental learning to occur simultaneously. Because of the uniqueness of the method, and possible appeal to students, it is recommended that incidental stimuli be used in remedial teaching. The remedial teaching of English grammar, in particular would seem to be an area that could utilize a teaching method similar to the one employed in this study.

VI. SUMMARY

(a) Problem: This project investigated the effect of incidental visual stimuli on the efficiency of learning factual material by freshmen college students.

The answers to the following five principal questions were sought in respect to the effect of incidental visual stimuli in the several learning situations employed. Does the provision of incidental stimuli, when used to facilitate learning result in:

1. Improved test performance?
2. Greater improvement in test performance than identical brief, high intensity stimuli?
3. Improvement in test performance associated with sex difference?
4. Improvement in test performance associated with color of focal material and cue words?
5. Greater improvement in test performance when the subjects control the presentation of focal material and incidental stimuli by means of a group teaching device?

A 5 x 2 analysis of variance was used to test null hypotheses with respect to treatment method, sex difference, and the interaction of these effects where the criterion variable was difference in test and retest score on the test instrument.

(b) Method: The subjects were a stratified random sample of 80 male and 80 female Saint Leo College freshmen divided into five groups of 16 males and 16 females such that each group had approximately the same mean verbal ability. One group was designated the control or no cue group while the other four groups were the experimental groups. These latter groups received different treatment in respect to incidental cue magnitude, color of focal material and cue word, and method of incidental cue presentation.

The learning situations employed involved the visual presentation, using two projectors, of 32 slides showing 32 unrelated "bits" of factual information and 32 paired cue slides. The incidental stimulus or cue for each focal slide was a word closely associated with the factual material included in the related focal slide.

The procedure consisted of highly motivating the subjects and then showing the material on the 32 focal slides to all groups, followed by a test using the prepared test instrument. The second part of the procedure consisted of the treatment and retest of each of the five groups separately.

(c) Results: The provision of non-colored incidental stimuli resulted in improved test performance. ($t = -5.79$, $p < .01$).

The provision of incidental stimuli did not result in:

1. Greater improvement in test performance than identical brief, high intensity stimuli. ($t = -1.13$, $p > .05$).
2. An improvement in test performance associated with sex. ($F = .05$; F for P .05 must be 3.91).
3. Greater improvement in test performance associated with the color of focal material and cue words. ($t = 1.59$, $p > .05$).
4. Greater improvement in test performance when the subjects controlled the presentation of focal material and incidental stimuli by means of a group teaching device. ($t = 0.38$, $p > .05$).

There was no interaction between treatment method and sex difference. ($F = .04$; F for P .05 must be 2.43).

The null hypothesis for treatment method was rejected. ($F = 10.1$; F for P .01 must be 3.44).

In respect to the various methods of cue presentation, all proved to result in significant test improvement:

1. For colored focal material and cues, $t = -3.24$, $p < .01$.
2. For brief, high intensity cues, $t = -5.88$, $p < .01$.
3. For subject controlled presentation of material and cues, $t = -4.45$, $p < .01$.

(d) Highlights: The results emphasize the importance of motivation in connection with incidental learning. The finding that motivated college students can improve their test performance through the use of incidental stimuli implies that it is possible to improve the efficiency of the learning of factual material in the classroom by causing both incidental and intentional learning to occur simultaneously.

(e) Recommendation: The teaching method employed in this study seems to be particularly suitable for remedial teaching in areas dealing primarily with factual material. It is therefore recommended that a further study be conducted to determine the efficiency of this method in teaching remedial English grammar to college level students.

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Appendix I

Sample Focal Slide

The ability of the labor force to produce the goods we need depends not so much on the total number employed as it does on the productivity of workers; that is, on the _____ of goods and services that individual workers can turn out in a given period of time.

Sample Cue Slide

QUANTITY

Sample Test Question

The ability of the labor force to produce the goods we need depends, not so much on the total number employed as it does on the productivity of workers; that is, on the _____ of goods and services that individual workers can turn out in a given period of time.

A. durability B. utility C. practicality D. amount E. quality

Appendix II

TEST INSTRUMENT

1. The ability of the labor force to produce the goods we need depends not so much on the total number employed as it does on the productivity of workers; that is, on the _____ of goods and services that individual workers can turn out in a given period of time.
A. durability B. utility C. practicality D. amount
E. quality

2. Freedom is involved when we accept the realities not by necessity but by choice. This means that the acceptance of limitations need not at all be a "Giving Up", but can and should be a/an _____ act of freedom.
A. emphatic B. constructive C. negative D. abortive
E. conducive

3. The Senate is a federal institution. It is not a democratic one, at least insofar as democratic principles _____ an equality of representation for people as people.
A. establish B. necessitate C. regulate D. imply
E. engender

4. The national courts have what is known as equity jurisdiction. This is the power to interpret and apply the law of equity to _____ civil action.
A. regional B. common C. appropriate D. controversal
E. indignant

5. Induction is a manner of learning, a mental analysis. Deduction is the application of our knowledge to the _____ of a class.
A. members B. anomalies C. qualities D. interpretation
E. knowledge

6. Current fiscal policy is generally more crucial than is the level of existing debt. If the major aim is to achieve and maintain high-level output, the level of public debt in itself becomes a _____ effect of stabilizing fiscal policy.
A. mandatory B. residual C. monetary D. balancing
E. vacillating.

7. Verbal aggression has distinct advantages over more direct and overt forms such as attack and destructiveness. It is economical and facile, more easily _____, and does not cause the anxiety or guilt that goes along with the more

overt forms.
A. distinguishable B. eradicated C. retracted D. defined
E. subordinated

8. Accidental change more or less fulfills the fundamental conditions and requirements of change. It does not do so perfectly because the fundamentals are _____ in substantial changes.
A. initiated B. co-extensive C. presumed D. transformed
E. required

9. The various musical instruments necessarily use a common pitch vocabulary. Their function so far as pitch is concerned is the _____ of tones that conform to the chromatic scale.
A. spacing B. production C. manipulation D. channeling
E. extension

10. Management does not find it difficult to determine the effects of cost changes on current operations. It is more difficult, however, for management to visualize the _____ of such changes on different levels of operation.
A. need B. effects C. application D. magnitude E. causes

11. The present strong position occupied by unions did not happen overnight. The history of organized labor has been marked by _____ struggles for recognition and organization development.
A. precipitous B. dangerous C. gradual D. rapid
E. conflicting

12. Harmonic movement is generated by the tendency of the active chord to be resolved in the chord at rest. Dissonance is restlessness and activity; consonance is relaxation and fulfillment. The dissonant chord creates _____ while the consonant chord resolves it.
A. tension B. expansion C. flaccidity D. hostility
E. tonation

13. A direct and superficial examination of things does not always enable us to conclude that reality is identical with perception. Reasoning and _____ must intervene to correct the direct impression of the senses.
A. cognition B. flexibility C. experience D. deduction
E. time

14. Human science is based on the physical study of phenomena. We try to link these facts together by means of _____

that is to say, by qualitative and quantitative relations.
A. laws B. analyses C. experimentation D. adjuncts
E. datum

15. The power of art to express emotion is self-evident to the classicist, whereas to the romanticist it is a constant source of wonder. The classical artist regards neither his _____ nor his personal experience as the primary material of his art.
A. ability B. temperament C. age D. individualism
E. heritage

16. The presence or absence of class struggles often depends on non-economic factors. Marx's advocacy of class struggles may bring them about, even though they be _____ to the economic interests of workers.
A. detrimental B. conducive C. contrary D. irrelevant
E. similar

17. Music has been called the language of emotions. This is not an unreasonable metaphor, for music, like language, aims to _____.
A. sooth B. arouse C. communicate D. accommodate
E. contract

18. The artist is part of the world about him. He can emerge only in an environment that cultivates art. A man could hardly develop a gift for writing symphonies in a society that had no _____.
A. orchestras B. sensitivity C. communication D. affluence
E. aesthetics

19. The desire for direct communication led composers to use a large number of expressive terms intended to serve as clues to the mood of the music. The result was that a highly _____ vocabulary sprang up.
A. technical B. altruistic C. motile D. sympathetic
E. characteristic

20. Light, like sound is a form of energy. Evidences of energy _____ involving light are constantly observed.
A. manifestations B. fixations C. transformations
D. demonstrations E. containment

21. As we look back over the history of art we find that one thing never changes, and that is the element of change, itself. What does vary from age to age is the _____ of change.
A. rate B. volume C. quality D. propensity E. value

22. A scale is an arrangement of series of tones. Specifically, a scale presents the tones of the key in consecutive order, ascending or descending. It is, consequently, a statement of _____.
A. rhythm B. movement C. harmony D. intonation
E. arrangement

23. Dance springs from man's joy in his body, his love of expressive gesture, his release of tension through rhythmic movement. It brightens the pleasure of being and at the same time mirrors the life of the _____.
A. spirit B. body C. intellect D. age E. society

24. In many species of plants, seeds require a period of relative rest or dormancy before they are able to germinate or sprout. This dormant period is advantageous to seeds, particularly in _____ zones.
A. frigid B. torrid C. erogenous D. temperate E. partisan

25. Drawings and prints are of special interest to the student, both for their intrinsic value and because they are comparatively inexpensive. In them the person of small means can afford _____ works of art.
A. contemporary B. banal C. original D. attractive
E. priceless

26. We perceive quantity intuitively. All of our sense perceptions, which are intuitive, depend upon the _____ of matter.
A. reality B. extension C. existence D. control
E. spirituality

27. In the ancient world before Greece, the things that were not seen became more and more the only things of great importance. The new power of mind that marked Greece arose in a world facing toward the way of the _____.
A. sun B. heavens C. spirit D. emperors E. philosophers

28. When we talk about the sources of art subjects, we are thinking primarily of subjects which demand some knowledge on the part of the critic if he is to get the idea the artist had in mind. The number of subjects used in this way is _____.
A. limitless B. limited C. divided D. stationary
E. controlled

29. Legend may be defined as history that is not or cannot be authenticated. It may be believed and in its earlier stages is usually given credence, but the facts are not _____.

A. verifiable B. subjective C. objective D. distinctive
E. contested

30. The process one experiences in making adjustments and adaptations to living is called learning. It is a rather permanent modification of _____ as a result of being exposed to various stimuli or experiences.
A. intelligence B. perception C. grades D. behavior
E. temperament

31. Probably the oldest and most commonly practiced political action of organized labor is lobbying. The American Federation of Labor has almost since its _____ spent much time and effort in trying to influence legislation.
A. inception B. merger C. development D. unification
E. re-organization

32. The indispensable role of experiment in modern science is universally recognized. In general, experiment would seem to involve a study of phenomena which occur under _____ varied and controlled conditions.
A. systematically B. naturally C. artificially D. methodically
E. externally.